Technology Opportunity

Three-Dimensional Analysis Codes for Turbomachinery

The National Aeronautics and Space Administration (NASA) seeks to transfer NASA-developed three-dimensional (3-D) methods for analyzing turbomachinery blading.

Potential Commercial Uses

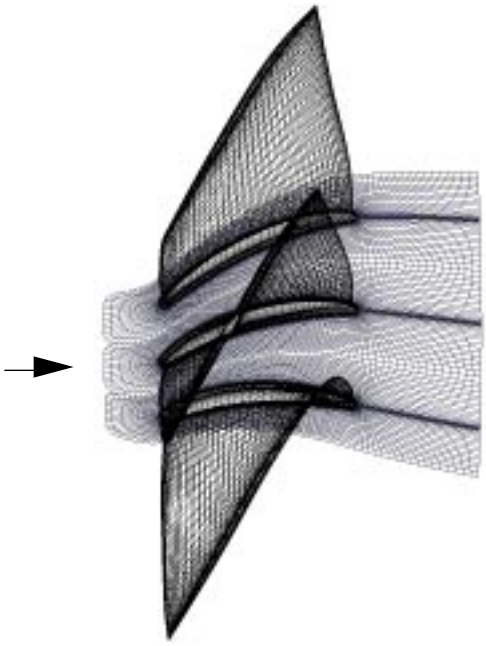
- Analyze commercial pump and compressor designs
- Aircraft propulsion
- Auxiliary power
- Automotive engine
- Turbochargers

Benefits

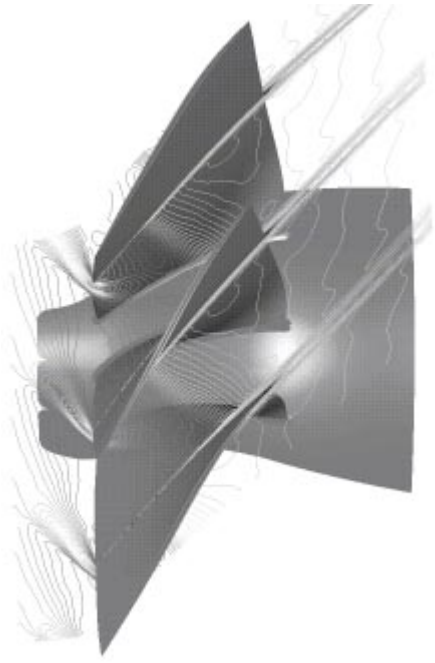
- Higher efficiencies
- Faster design cycle times
- Lower direct operating costs
- Improved reliability

The Technology

Three-dimensional methods for analyzing turbomachinery blading have been developed to determine the full 3-D flow field characteristics of the airfoils. The codes typically can be used to determine blade-loading efficiency potential. They



Three-dimensional grid.



Three-dimensional flow solution.

National Aeronautics and Space Administration
Lewis Research Center

Compressor Research and Development 3-D Codes

(a) Description of NASA compressor aerothermodynamic prediction codes

Code	Brief code desciption
TIGGC3D	3-D interactive H-grid generator for turbomachinery; SGI platforms
TCGRID	3-D C-grid generator for turbomachinery
RVC3D	Full 3-D viscous turbomachinery flow solver

(b) Aerothermodynamic code characteristics

Detailed design and problem solving stage	Code requirements	Typical trade studies	Aerothermodyamic uses
*RVC3D *TIGGC3D *TCGRID	Excellent accuracy; Computationally affordable; User friendly; Robust	Grid generation; Detailed blading; Investigation of critical problem areas	Detailed performance prediction; Pressure/thermal loads

(c) Experience and time requirements for NASA compressor aerothermodynamic prediction codes

Code	Typical user experience	Typical time to learn	Set-up time	Typical times for an average case	Computer required	Where to obtain the code
TIGGC3D	Moderate	~ 2 wks	< 1 day	~ seconds	Mini	Lewis
TCGRID	Moderate	~ 2 wks	< 1 day	~ seconds	Mini	Lewis
RVC3D	High	~ 3 to 6 wks	< 2 wk	~ hrs-days	Super mini	Lewis

can also be used to estimate the performance and pressure loads. The codes were developed as an analysis method capable of determining the performance of a compressor with a reasonable degree of fidelity.

Over a 10-year time period NASA Lewis Research Center has conducted substantial compressor aerodynamic research as a basis for the development of 3-D codes. These codes are fairly robust, computationally affordable, and reasonably accurate. The codes are best used to analyze and compute significant detailed characteristics of compressor aerodynamics.

Options for Commercialization

NASA Lewis Research Center has no patents on the codes and release is subject to export law controls. Any company may acquire the codes and improve on their capability to do complex 3-D analysis. The codes may be used to analyze 3-D designed compressors for commercial applications.

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Key Words

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Grid generation

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